EXHIBIT 4

IN THE UNITED STATES DISTRICT COURT
FOR THE WESTERN DISTRICT OF TEXAS
WACO DIVISION

WSOU INVESTMENTS, LLC D/B/A BRAZOS LICENSING AND DEVELOPMENT, *Plaintiff*,	§	**Case No. 6:20-cv-00957-ADA**
	§	**JURY TRIAL DEMANDED**
v.	§	
ONEPLUS TECHNOLOGY (SHENZHEN) CO., LTD., *Defendant.*	§	

PLAINTIFF'S DISCLOSURES OF
PRELIMINARY INFRINGEMENT CONTENTIONS

Pursuant to the Court's Order Governing Proceeding – Patent Case ("Order Governing Proceeding"), Plaintiff WSOU Investments, LLC d/b/a Brazos Licensing and Development ("WSOU") hereby provides its Initial Infringements Contentions to defendant OnePlus Technology (Shenzhen) Co., Ltd. ("OnePlus" or "Defendant") for U.S. Patent No. 8,712,708 (the "'708 Patent").

WSOU makes this disclosure based on the information presently available to it. Discovery in this case has not started, and WSOU reserves its right to amend or supplement these disclosures as permitted by the Federal Rules of Civil Procedure, by the local rules of the Western District of Texas, and by order of the Court, including the Court's Order Governing Proceedings.

For each Asserted Claim, Plaintiff identifies the following Accused Instrumentalities of which it is currently aware. The identification of Accused Instrumentalities is based on Plaintiff's research and analysis to date, without the benefit of discovery from the Defendant. Plaintiff reserves the right to add, delete, substitute or otherwise amend this list of Accused

Instrumentalities based on discovery or other circumstances, in a manner consistent with the Federal Rules of Civil Procedures, local rules, and standing orders.

The Accused Instrumentalities include, without limitation, the following:

- OnePlus Mobile Phones (such as OnePlus 8, OnePlus 7 Pro, OnePlus 8 Pro, OnePlus 8T, OnePlus 9, OnePlus 9 Pro).
- All past, current and future OnePlus products and services that operate in the same or substantially similar manner as the specifically identified products and services above and described in Exhibit 1.
- All past, current and future OnePlus products and services that have the same or substantially similar features as the specifically identified products and services above and described in Exhibit 1.

Plaintiff's infringement contentions apply to the Accused Instrumentalities as well as all other past, current and future hardware and software products and services developed, made, used, offered for sale, sold, imported, and provided by OnePlus that contain or makes use of the Patented Technology.[1]

Based upon currently available information, WSOU asserts that OnePlus has infringed and/or continues to infringe the patent and claims identified in the attached claim charts (the "Asserted Claims" of the "Patent-in-Suit"). Infringement claim charts evidencing the correspondence between (i) the elements of the Asserted Claims, and (ii) the corresponding items of the accused products are attached hereto. Further, Exhibit 1, which is attached hereto and incorporated by reference, is an exemplary infringement claim chart identifying specifically where

[1] "Patented Technology" means all technologies described in the claims of the Patent-in-Suit.

each limitation of each Asserted Claim is found within each Accused Instrumentality or practiced by each Accused Instrumentality.

Plaintiff asserts that Defendant has directly infringed and continues to directly infringe the Asserted Claims literally through the Accused Instrumentalities by making, using, offering for sale, and/or selling, or importing into the United States the Accused Instrumentalities. To the extent that Defendant alleges that one or more limitations of the Asserted Claims are not literally found in the Accused Instrumentalities, Plaintiff alleges that such limitations are found in or practiced by the Accused Instrumentalities under the doctrine of equivalents. Any differences alleged to exist between any of the Asserted Claims and any of the Accused Instrumentalities are insubstantial and that each Accused Instrumentality also meets each limitation under the doctrine of equivalents as the identified features of the Accused Instrumentality performs substantially the same function in substantially the same way to achieve substantially the same result as the corresponding claim limitation. WSOU reserves the right to assert infringement solely under the doctrine of equivalents with respect to any particular claim element(s), if warranted by discovery, further analysis, and/or claim constructions in this case.

Plaintiff further asserts that Defendant has indirectly infringed and continues to indirectly infringe by actively inducing infringement of one or more of the claims of the Asserted Patent through the Accused Instrumentalities. Plaintiff also asserts that these third-parties directly infringe at least one or more of the claims of the Asserted Patent through the manufacture, use, sale, offer to sell, or importation of the Accused Instrumentalities.

For example, Defendant has actively induced infringement by encouraging the use of the Accused Instrumentalities in ways that infringe each Asserted Claim. Defendant knew or should have known that such encouragement would induce infringement. Defendant has taken active

steps with the specific intent to encourage and cause others to use each Accused Instrumentality in ways that infringe each Asserted Claim. Such active steps by Defendant with specific intent to induce infringement have included, among other things, advertising, promoting, marketing, making available for use, offering to sell, and/or selling the Accused Instrumentalities to others; encouraging and influencing others to import, offer to sell, and/or sell the Accused Instrumentalities; directing and instructing others to use the Accused Instrumentalities in infringing ways; and by providing the Accused Instrumentalities to others. OnePlus has performed the aforementioned active steps with the knowledge of the Asserted Patent at least as of the date when the complaint in this case was filed. OnePlus has known or should have known that the acts it has induced constitute infringement because, for instance, it has been aware that end users and resellers will purchase the Accused Instrumentalities will use them, resulting in direct infringement.

Further, for instance, the Accused Instrumentalities are known by Defendant to be especially made or especially adapted for use to infringe the Asserted Patent, and are not staple articles or commodity of commerce suitable for substantial non-infringing uses. Defendant contributes to the infringement of the Asserted Patent by making available for use, offering for sale, selling, and/or importing the Accused Instrumentalities to third parties, who use the Accused Instrumentalities and/or practice one or more claims of the Asserted Patent. Moreover, Defendant has had notice of the Asserted Patent at least as of the filing of the Complaint in this case.

These Infringement Contentions, including Exhibit 1, are based upon publicly-available information, and Plaintiff's research and analysis to date. The Accused Instrumentalities involve confidential, proprietary designs that are not publicly available, and Defendant has not yet provided discovery. Discovery is ongoing, and Plaintiff anticipates that the subject matter of these

infringement contentions will be the subject of expert discovery. Discovery will provide evidence of Defendant's infringement, may lead to the discovery of additional instances of infringement, and may also enable identification of additional claims that are infringed by Defendant. Plaintiff reserves the right to add, delete, substitute, or otherwise further amend these Infringement Contentions based on discovery or other circumstances, in a manner consistent with the Federal Rules of Civil Procedures, local rules, and standing orders. Plaintiff explicitly reserves the right to further modify and/or supplement these contentions with additional or different theories and/or additional or different evidence. Further, WSOU reserves the right to supplement or revise its infringement contentions and/or chart, including identification of additional asserted claims, based on, for example, new versions or variations of one or more of the Accused Instrumentalities that are later discovered.

PRIORITY DATE

Each of the Asserted Claims of the '708 Patent is entitled to a priority date of no later than Nov. 2, 2001. The subject matter described by the Asserted Claims, however, may have been conceived and reduced to practice prior to this priority date. WSOU also reserves the right to identify any portions of the file history as containing evidence of conception and reduction to practice. Plaintiff's research and analysis is ongoing and Plaintiff reserves the right to assert that the claims are entitled to a priority date that is earlier than the above date.

Dated: May 18, 2021

RESPECTFULLY SUBMITTED,

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CERTIFICATE OF SERVICE

A true and correct copy of the foregoing instrument was served or delivered electronically to all counsel of record, on this 18th day of May, 2021.

/s/ Jonathan K. Waldrop
Jonathan K. Waldrop

Exhibit 1 to
WSOU Investments, LLC's
Infringement Contentions

Infringement Claim Chart of U.S. Patent No. 8,712,708 (the "Asserted Patent")

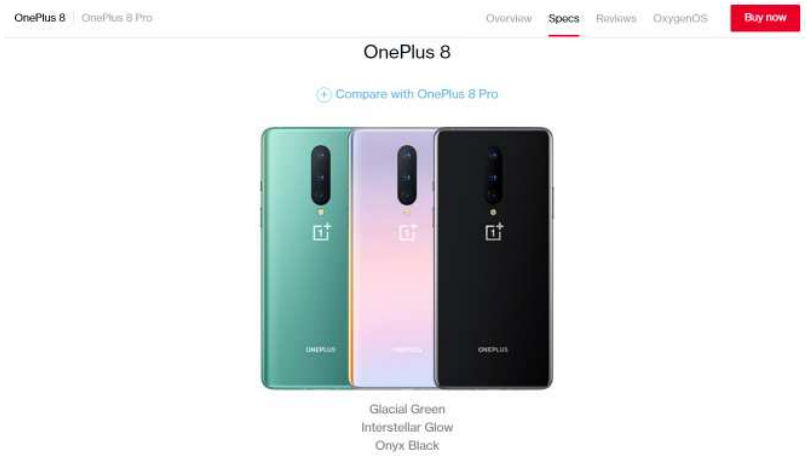
The Accused Instrumentalities include, without limitation, OnePlus Technology (Shenzhen) Co., Ltd. ("OnePlus" or "Defendant"), OnePlus Mobile Phones such as OnePlus 8, OnePlus 7 Pro, OnePlus 8 Pro, OnePlus 8T, OnePlus 9, OnePlus 9 Pro; all past, current and future OnePlus products and services that operate in the same or substantially similar manner as the specifically identified products and services; and all past, current and future OnePlus products and services that have the same or substantially similar features as the specifically identified products and services.

WSOU Investments, LLC ("WSOU" or "Plaintiff") contends that OnePlus, including OnePlus's employees, directly infringes each of the Asserted Claims, either literally or under the doctrine of equivalents. WSOU also contends that OnePlus has indirectly infringed and continues to indirectly infringe by contributing to and actively inducing infringement of one or more of the Asserted Claims.

WSOU does not intend this exemplary claim chart to be limiting, and WSOU reserves its rights to pursue other accused instrumentalities, patent claims, evidence, and infringement arguments in this case.

Exhibit(s)	Description	Link
Exhibit A	OnePlus 8 Specification Page	https://www.oneplus.com/8/specs
Exhibit B	Article on Warp Charge by Android Central	https://www.androidcentral.com/warp-charge
Exhibit C	Blog on Warp Charge 30 by Volta Charger	https://voltacharger.com/blogs/news/warp-charge-30-faster-charging-for-your-oneplus-device
Exhibit D	How to charge the battery correctly	https://forums.oneplus.com/threads/how-to-charge-the-battery-correctly.780695/
Exhibit E	GitHub OnePlus OSS Android Kernel Power Supply	https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/cad09e061ef6cf689a4a1e54d27562e0f042236a/drivers/power/supply/power_supply_sysfs.c#L347
Exhibit F	GitHub OnePlus OSS Android Frameworks Base	https://github.com/OnePlusOSS/android_frameworks_base/blob/95ba353daa05fdd1c6011554ab7152fadfcdb932/services/core/java/com/android/server/am/BatteryStatsService.java#L337
Exhibit G	GitHub OnePlus OSS Android Kernel APM Power	https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/cad09e061ef6cf689a4a1e54d27562e0f042236a/drivers/power/supply/apm_power.c
Exhibit H	GitHub OnePlus OSS Android Kernel Charger	https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/d0cd6cd30f8e10b209461f24462ed316c76bc913/drivers/power/supply/axp288_charger.c#L363
Exhibit I	GitHub OnePlus OSS Android Frameworks Base Battery Statistics	https://github.com/OnePlusOSS/android_frameworks_base/blob/95ba353daa05fdd1c6011554ab7152fadfcdb932/core/java/com/android/internal/os/BatteryStatsImpl.java#L8705

Exhibit(s)	Description	Link
Exhibit J	Android Battery Statistics	https://android.googlesource.com/platform/frameworks/base.git/+/master/core/java/com/android/internal/os/BatteryStatsImpl.java

Claims	OnePlus 8, including OnePlus Smartphone based on Android OS (The accused product)
1Pre. A method, comprising: **1a.** detecting, by an apparatus, an availability of a charger adapter;	The accused product practices a method that comprises of detecting, by an apparatus, an availability of a charger adapter. OnePlus provides smartphones such as OnePlus 8, OnePlus 7 Pro, OnePlus 8 Pro, OnePlus 8T, OnePlus 9, OnePlus 9 Pro that comes along with a Warp Charge 30 Power Adapter. The Warp Charge 30 Power Adapter (i.e. charger adapter) delivers a 30-Watt (i.e. W) power output for fast charging the accused product. See Fig. 1 & Fig. 2. The accused product detects and displays the 'Warp charging' as its gets connect (i.e. available) with the Warp Charge 30 Power Adapter via the Warp type-c cable as shown in Fig. 3. **Citation 1: OnePlus 8**  Fig. 1 Source: https://www.oneplus.com/8/specs, Page 1, Last Accessed May 18, 2021, Exhibit A

Citation 2: Warp Charge 30 Power Adapter

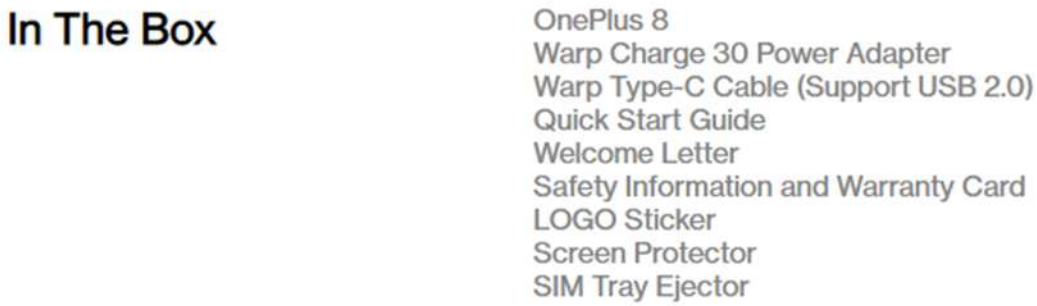
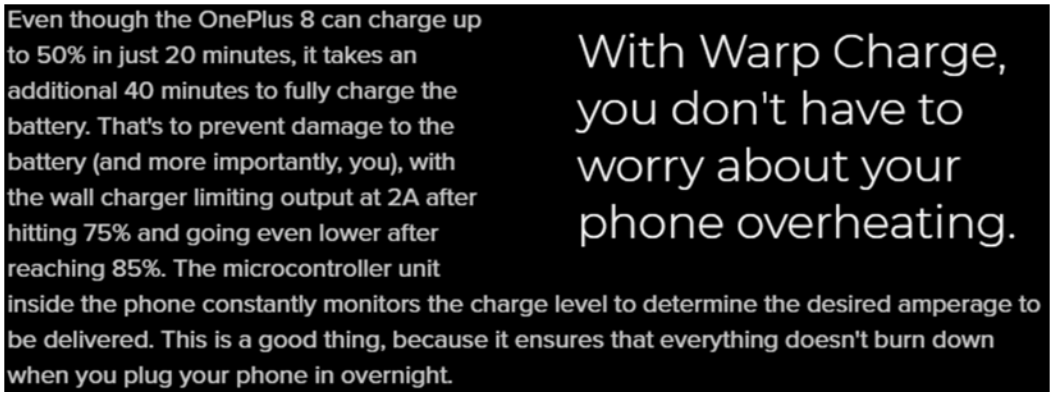


Fig. 2

Source: https://www.oneplus.com/8/specs, Page 4, Last Accessed May 18, 2021, Exhibit A

	Citation 3: Warp Charging display  Fig. 3 Source: https://www.androidcentral.com/warp-charge, Page 3, Last Accessed July 24, 2020, Exhibit B
1b. determining, by the apparatus, whether a battery charging point is in a constant current	The method that accused product practices comprises, whether a battery charging point is in a constant current phase or in a constant voltage phase, based on pre-determined battery charging characteristics, wherein the pre-determined battery charging characteristics comprise constant current phase charging characteristics and constant voltage phase charging characteristics.

phase or in a constant voltage phase, based on pre-determined battery charging characteristics, wherein the pre-determined battery charging characteristics comprise constant current phase charging characteristics and constant voltage phase charging characteristics;	As described in the patent US'708B2 [Page 14, Line 18, Column 7] *"The capacity of a battery is the quantity of electrical charge stored in the battery at a given level. The capacity of a fully charged battery is usually measured in amp-hours (AH) or milliamp-hours (mAH) and is a measure of the size of the battery."* The Warp Charge technology uses constant current charging (i.e. constant current phase) at multi-step of voltage open loop (or, multiple stages of voltage change). See Fig. 4. **Citation 4: Warp Charge Uses Constant Current Charging** Similar to Dash Charge, the Warp Charge technology is based on OPPO's Super Voltage Open Loop Multi-step Constant-Current Charging (Super VOOC) standard. At a regular voltage of 5V, Warp charge can attain 30W at 6A. Fig. 4 Source: https://voltacharger.com/blogs/news/warp-charge-30-faster-charging-for-your-oneplus-device, Page 2, Last Accessed May 18, 2021, Exhibit C As described in the patent US'708B2 [Page 13, Line 14, Column 5] *"As the accumulated charge in the battery 160 increases, there comes a point at which the operation of the CC/CV charger IC 154 passes from the constant current (CC) phase to the constant voltage (CV) phase. In accordance with an embodiment of the invention, estimating the remaining charging time of the rechargeable battery 160 is based on determining whether the battery's charging point is in the constant current phase or in the constant voltage phase."* OnePlus 8 includes a microcontroller unit that constantly monitor the charge level to determine the desired amperage (or, current) to be delivered. The accused product comprises a charging point (e.g. integrated circuit,

	or another hardware) that supplies constant current/constant voltage to the battery. The accused product switches to the constant voltage phase, when the accused product (or, microcontroller unit) have change in desired amperage to prevent battery from overheating and burn down. See Fig. 5. **Citation 5: Microcontroller unit determines desired amperage**  Fig. 5 Source: https://www.androidcentral.com/warp-charge, Page 3, Last Accessed July 24, 2020, Exhibit B Fig. 6 to Fig. 9 shows a snippet of OnePlus kernel source code that is installed onto the accused product. The accused product determines whether the power supply (or, Warp Charge 30 Power Adapter) is in constant current phase or constant voltage phase and associates the psp enum value accordingly.

Citation 6: psp enum value determination

```
17
18  #define PSY_PROP(psy, prop, val) (power_supply_get_property(psy, \
19                            POWER_SUPPLY_PROP_##prop, val))
20
21  #define _MPSY_PROP(prop, val) (power_supply_get_property(main_battery, \
22                                                           prop, val))
23
24  #define MPSY_PROP(prop, val) _MPSY_PROP(POWER_SUPPLY_PROP_##prop, val)
```

Fig. 6

Source :

https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/cad09e061ef6cf689a4a1e54d27562e0f042236a/drivers/power/supply/apm_power.c, Page 1, Last Accessed May 18, 2021, Exhibit G

Citation 7: Power Supply Attribute and Property

```
144  static ssize_t power_supply_show_property(struct device *dev,
145                                            struct device_attribute *attr,
146                                            char *buf) {
147          ssize_t ret;
148          struct power_supply *psy = dev_get_drvdata(dev);
149          enum power_supply_property psp = attr - power_supply_attrs;
150          union power_supply_propval value;
```

Fig. 7

Source:

https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/cad09e061ef6cf689a4a1e54d27562e0f042236a/drivers/power/supply/power_supply_sysfs.c#L353, Page 2, Last Accessed May 18, 2021, Exhibit E

Citation 8: Device Attributes for Power Supply

```
298  /* Must be in the same order as POWER_SUPPLY_PROP_* */
299  static struct device_attribute power_supply_attrs[] = {
300          /* Properties of type `int' */
301          POWER_SUPPLY_ATTR(status),
302  /* @bsp, 2018/07/13 Battery & Charging porting */
303          POWER_SUPPLY_ATTR(set_allow_read_extern_fg_iic),
304          POWER_SUPPLY_ATTR(cc_to_cv_point),
305          POWER_SUPPLY_ATTR(chg_protect_status),
```

Fig. 8

Source:

https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/cad09e061ef6cf689a4a1e54d27562e0f042236a/drivers/power/supply/power_supply_sysfs.c#L353, Page 4, Last Accessed May 18, 2021, Exhibit E

Citation 9: psp enum value determines

```
363 static int axp288_charger_usb_set_property(struct power_supply *psy,
364                                               enum power_supply_property psp,
365                                               const union power_supply_propval *val)
366 {
367         struct axp288_chrg_info *info = power_supply_get_drvdata(psy);
368         int ret = 0;
369         int scaled_val;
370
371         switch (psp) {
372         case POWER_SUPPLY_PROP_CONSTANT_CHARGE_CURRENT:
373                 scaled_val = min(val->intval, info->max_cc);
374                 scaled_val = DIV_ROUND_CLOSEST(scaled_val, 1000);
375                 ret = axp288_charger_set_cc(info, scaled_val);
376                 if (ret < 0)
377                         dev_warn(&info->pdev->dev, "set charge current failed\n");
378                 break;
379         case POWER_SUPPLY_PROP_CONSTANT_CHARGE_VOLTAGE:
380                 scaled_val = min(val->intval, info->max_cv);
381                 scaled_val = DIV_ROUND_CLOSEST(scaled_val, 1000);
382                 ret = axp288_charger_set_cv(info, scaled_val);
383                 if (ret < 0)
384                         dev_warn(&info->pdev->dev, "set charge voltage failed\n");
385                 break;
386         case POWER_SUPPLY_PROP_INPUT_CURRENT_LIMIT:
387                 ret = axp288_charger_set_vbus_inlmt(info, val->intval);
388                 if (ret < 0)
389                         dev_warn(&info->pdev->dev, "set input current limit failed\n");
390                 break;
391         default:
392                 ret = -EINVAL;
393         }
```

Fig. 9

Source:https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/d0cd6cd30f8e10b209461f24462ed316c76bc913/drivers/power/supply/axp288_charger.c#L363, Page 5, Last Accessed May 18, 2021, Exhibit H

Fig. 10 and Fig. 11 shows snippets of OnePlus kernel source code that is installed onto the accused product. The accused product stores current and voltage attributes which are used to compute the constant current phase charging characteristics and constant voltage phase charging characteristics, respectively.

Citation 10: Constant Current Phase Charging Attributes

```
340        POWER_SUPPLY_ATTR(current_max),
341        POWER_SUPPLY_ATTR(current_now),
342        POWER_SUPPLY_ATTR(current_avg),
343        POWER_SUPPLY_ATTR(current_boot),

353         POWER_SUPPLY_ATTR(constant_charge_current),
354         POWER_SUPPLY_ATTR(constant_charge_current_max),

385         POWER_SUPPLY_ATTR(precharge_current),
386         POWER_SUPPLY_ATTR(charge_term_current),

404        POWER_SUPPLY_ATTR(input_current_max),
405        POWER_SUPPLY_ATTR(input_current_trim),
406        POWER_SUPPLY_ATTR(input_current_settled),
```

Fig. 10

Source:

https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/cad09e061ef6cf689a4a1e54d27562e0f042236a/drivers/power/supply/power_supply_sysfs.c#L353, Page 5, Last Accessed May 18 2021, Exhibit E

Citation 11: Constant Voltage Phase Charging Attributes

```
332         POWER_SUPPLY_ATTR(voltage_max),
333         POWER_SUPPLY_ATTR(voltage_min),
334         POWER_SUPPLY_ATTR(voltage_max_design),
335         POWER_SUPPLY_ATTR(voltage_min_design),
336         POWER_SUPPLY_ATTR(voltage_now),
337         POWER_SUPPLY_ATTR(voltage_avg),
338         POWER_SUPPLY_ATTR(voltage_ocv),
339         POWER_SUPPLY_ATTR(voltage_boot),

355         POWER_SUPPLY_ATTR(constant_charge_voltage),
356         POWER_SUPPLY_ATTR(constant_charge_voltage_max),

503         POWER_SUPPLY_ATTR(voltage_max_limit),
```

Fig. 11

Source:

https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/cad09e061ef6cf689a4a1e54d27562e0f042236a/drivers/power/supply/power_supply_sysfs.c#L353, Page 4, 5 & 6, Last Accessed May 18, 2021, Exhibit E

The accused product uses various characteristics such as battery percentage upon the time of charging, the time period over which the battery is charging, battery voltage to determine that if the charging point is in the constant current phase or the constant voltage phase. See Fig. 12 and Fig. 13.

Citation 12: Battery percentage on OnePlus 8

Fig. 12

Source: https://www.androidcentral.com/warp-charge, Page 3, Last Accessed July 24, 2020, Exhibit B

	Citation 13: Constant Current and Constant Voltage Phase 4) The process of charging li-ion batt goes like this (let's start from full current): a) CC (constant current) stage which means the battery takes full current, in this case 4A but frankly it's 3,4-3,6A. For 3,3Ah battery it's current around 1,1C, it's perfectly good value for battery life. b) when battery reaches certain point of voltage (on Dash I noticed it's around 60-70% approx.), current drops naturally and it keeps going down with increasing voltage c) CV (constant voltage) means BMS sets 4,2V (usual value for 100% capacity of lithium cell) and current is going to 0A since your battery is almost charged at this point e.g 4,1V and charger gives 4,2V which is 4,2-4,1V = 0,1V, it allows really low current. But it's important to charge to 100% because last stage lasts long but it gives you significantly more capacity, especially for only 3,3Ah cell. Moreover, this stage is most dangerous because voltage for almost fully charged cell becomes unstable and when it takes current, it'll increase voltage easily and rapidly. That's why cut off current has to work and stops charging when it's time. The process can go a few times e.g. if battery goes >4,2V, the charger disconnects, waits few seconds, lower current from charger and starts charging again. And after e.g. 3 repeates, it ends the charging process for good. Fig. 13 Source: https://forums.oneplus.com/threads/how-to-charge-the-battery-correctly.780695/, Page 3, Last Accessed May 18, 2021, Exhibit D
1c. calculating, by the apparatus, a time remaining to charge in the constant current phase based on the constant current phase charging characteristics, if the	The method that accused product practices comprises, calculating a time remaining to charge in the constant current phase based on the constant current phase charging characteristics, if the battery charging point is in the constant current phase, and calculating a time remaining to charge in the constant voltage phase based on the constant voltage phase charging characteristics, if the battery charging point is in the constant voltage phase. The accused product detects and displays the type of power adapter that charges the device. The accused product uses the type of charging point connected and various other pre-determined characteristics such as the amount of electrical charge stores in the battery (i.e. battery level), full capacity (i.e. 4300mAH) of the battery installed in

battery charging point is in the constant current phase; and **1d.** calculating, by the apparatus, a time remaining to charge in the constant voltage phase based on the constant voltage phase charging characteristics, if the battery charging point is in the constant voltage phase;	the smartphone, and more to estimate the time remaining to charge the smartphone's battery in the near real-time. See Fig. 14 & Fig. 15. **Citation 14: Warp Charging Displays on OnePlus 8**  Fig. 14 Source: https://www.androidcentral.com/warp-charge, Page 3, Last Accessed July 24, 2020, Exhibit B

Citation 15: Non-removable 4300 mAh battery capacity

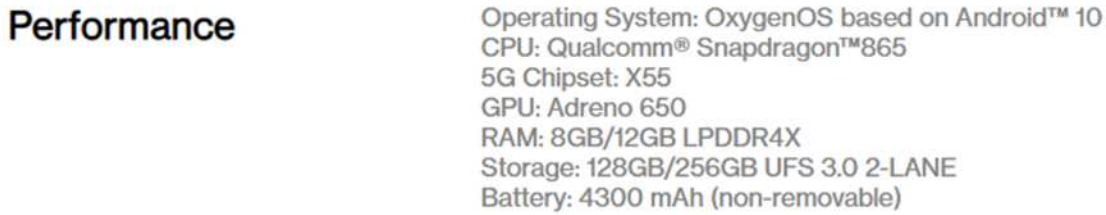


Fig. 15

Source: https://www.oneplus.com/8/specs, Page 1-2, Last Accessed May 18, 2021, Exhibit A

As described in the patent US'708B2 [Page 15, Line 57, Column 10] "*Step 408: if the battery charging point is in the constant current phase, calculating a time remaining to charge in the constant current phase based on the constant current phase charging characteristics and a time remaining to charge in the constant Voltage phase based on the constant Voltage phase charging characteristics. In step 408 the present capacity and the present charging current are also inputs for this calculation.*" and [Page 15, Line 65, Column 10] "*Step 410: if the battery charging point is in the constant Voltage phase, calculating a time remaining to charge in the constant Voltage phase based on the constant Voltage phase charging characteristics. In step 410 the present charging current is also an input for this calculation.*"

The accused product calculates the time to charge the device to 100% battery level. See Fig. 16.

Citation 16: Estimation of time left to reach the 100% battery level

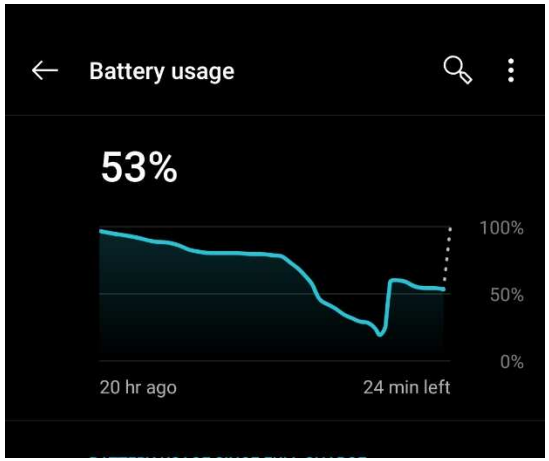


Fig. 16

Source: Snippet taken from OnePlus 3T

The accused product uses various characteristics (i.e. constant voltage phase charging characteristics) such as voltage that the charging point feeds, battery level, total battery capacity, and more such parameters at the constant current phase to estimate (or, calculate) the time remaining to charge the battery.

The accused product uses various characteristics (i.e. constant current phase charging characteristics) such as current that the charging point feeds, battery level, total battery capacity, and more at the constant voltage phase to estimate (or, calculate) the time remaining to charge the battery. See Fig. 17 to Fig. 20.

Citation 17: Constant Current Phase Charging Attributes

```
340         POWER_SUPPLY_ATTR(current_max),
341         POWER_SUPPLY_ATTR(current_now),
342         POWER_SUPPLY_ATTR(current_avg),
343         POWER_SUPPLY_ATTR(current_boot),

353         POWER_SUPPLY_ATTR(constant_charge_current),
354         POWER_SUPPLY_ATTR(constant_charge_current_max),

385         POWER_SUPPLY_ATTR(precharge_current),
386         POWER_SUPPLY_ATTR(charge_term_current),

404         POWER_SUPPLY_ATTR(input_current_max),
405         POWER_SUPPLY_ATTR(input_current_trim),
406         POWER_SUPPLY_ATTR(input_current_settled),
```

Fig. 17

Source:

https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/cad09e061ef6cf689a4a1e54d27562e0f042236a/drivers/power/supply/power_supply_sysfs.c#L353, Page 5, Last Accessed May 18, 2021, Exhibit E

Citation 18: Constant Voltage Phase Charging Attributes

```
332         POWER_SUPPLY_ATTR(voltage_max),
333         POWER_SUPPLY_ATTR(voltage_min),
334         POWER_SUPPLY_ATTR(voltage_max_design),
335         POWER_SUPPLY_ATTR(voltage_min_design),
336         POWER_SUPPLY_ATTR(voltage_now),
337         POWER_SUPPLY_ATTR(voltage_avg),
338         POWER_SUPPLY_ATTR(voltage_ocv),
339         POWER_SUPPLY_ATTR(voltage_boot),

355         POWER_SUPPLY_ATTR(constant_charge_voltage),
356         POWER_SUPPLY_ATTR(constant_charge_voltage_max),

503           POWER_SUPPLY_ATTR(voltage_max_limit),
```

Fig. 18

Source:

https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/cad09e061ef6cf689a4a1e54d27562e0f042236a/drivers/power/supply/power_supply_sysfs.c#L353, Page 4, 5 & 6, Last Accessed May 18, 2021, Exhibit E

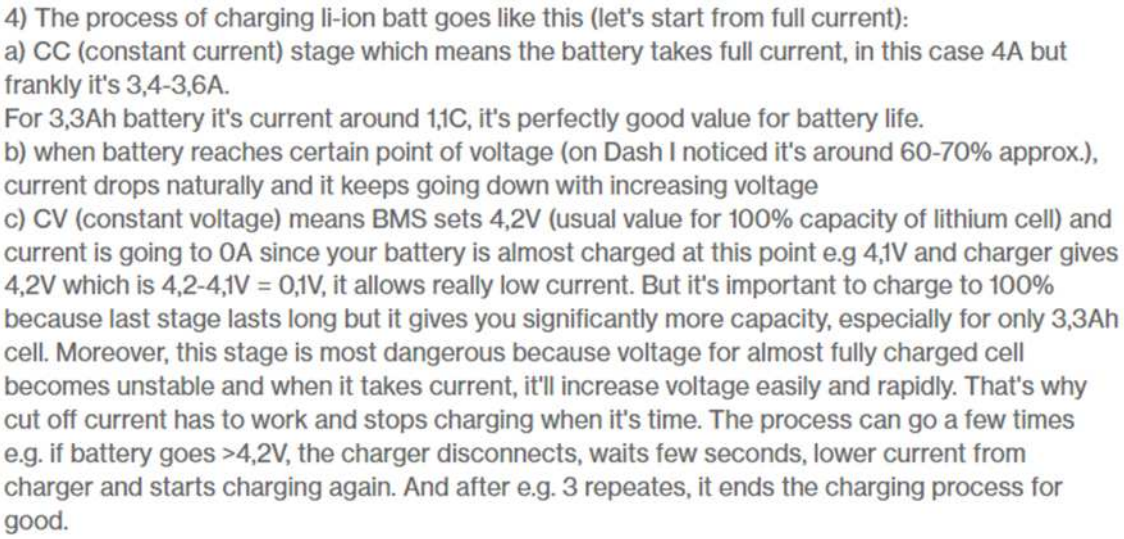
Citation 19: Stored Charge and Current Charge

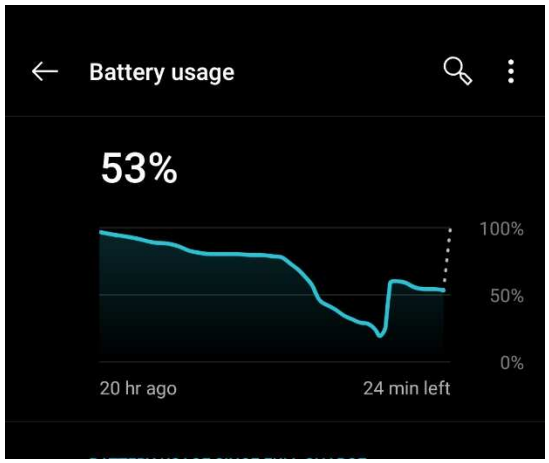
```
346         POWER_SUPPLY_ATTR(charge_full_design),
347         POWER_SUPPLY_ATTR(charge_empty_design),
348         POWER_SUPPLY_ATTR(charge_full),
349         POWER_SUPPLY_ATTR(charge_empty),
350         POWER_SUPPLY_ATTR(charge_now),
351         POWER_SUPPLY_ATTR(charge_avg),
352         POWER_SUPPLY_ATTR(charge_counter),
353         POWER_SUPPLY_ATTR(constant_charge_current),
354         POWER_SUPPLY_ATTR(constant_charge_current_max),
355         POWER_SUPPLY_ATTR(constant_charge_voltage),
356         POWER_SUPPLY_ATTR(constant_charge_voltage_max),
357         POWER_SUPPLY_ATTR(charge_control_limit),
358         POWER_SUPPLY_ATTR(charge_control_limit_max),
```

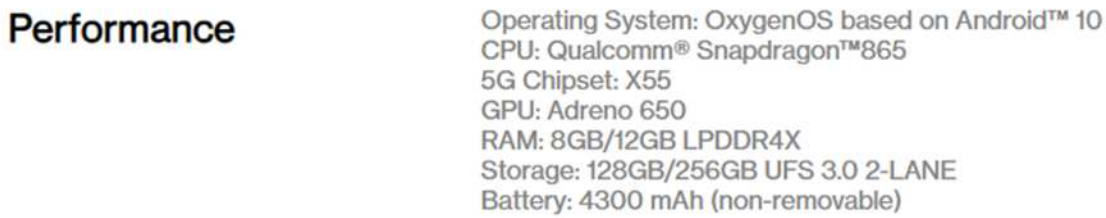
Fig. 19

Source:

https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/cad09e061ef6cf689a4a1e54d27562e0f042236a/drivers/power/supply/power_supply_sysfs.c#L353, Page 5, Last Accessed May 18, 2021, Exhibit E

	Citation 20: Constant Current Phase and Constant Voltage Phase  4) The process of charging li-ion batt goes like this (let's start from full current): a) CC (constant current) stage which means the battery takes full current, in this case 4A but frankly it's 3,4-3,6A. For 3,3Ah battery it's current around 1,1C, it's perfectly good value for battery life. b) when battery reaches certain point of voltage (on Dash I noticed it's around 60-70% approx.), current drops naturally and it keeps going down with increasing voltage c) CV (constant voltage) means BMS sets 4,2V (usual value for 100% capacity of lithium cell) and current is going to 0A since your battery is almost charged at this point e.g 4,1V and charger gives 4,2V which is 4,2-4,1V = 0,1V, it allows really low current. But it's important to charge to 100% because last stage lasts long but it gives you significantly more capacity, especially for only 3,3Ah cell. Moreover, this stage is most dangerous because voltage for almost fully charged cell becomes unstable and when it takes current, it'll increase voltage easily and rapidly. That's why cut off current has to work and stops charging when it's time. The process can go a few times e.g. if battery goes >4,2V, the charger disconnects, waits few seconds, lower current from charger and starts charging again. And after e.g. 3 repeates, it ends the charging process for good. Fig. 20 Source: https://forums.oneplus.com/threads/how-to-charge-the-battery-correctly.780695/, Page 3, Last Accessed May 18, 2021, Exhibit D
1e. wherein the time remaining to charge in the constant current phase is based on stored charge characteristics in	The accused product practices a method, wherein the time remaining to charge in the constant current phase is based on stored charge characteristics in the constant current phase, when the battery charging point is in the constant current phase and wherein battery stored charge characteristics comprises a battery stored charge value based on monitored tracking of battery charging and discharging.

the constant current phase, when the battery charging point is in the constant current phase and wherein battery stored charge characteristics comprises a battery stored charge value based on monitored tracking of battery charging and discharging.	As described in the patent US'708B2 [Page 14, Line 48, Column 7] "*Along with the measured data for datasets 210 and 215, the following information may be stored in the device 100 as dataset 220 for each combination of device 100 battery 160 type: 1 Charge current during CC phase (IBATCC); 2) Battery 160 voltage when the charging switches to the CV phase (VBATCV). If the battery 160 voltage slightly increases during the CV phase, a value of the lowest Voltage in the constant Voltage phase may be chosen; and 3Duration of the CV phase (TCVTOT).*" The accused product calculates and displays the amount of time life to charge the battery to 100% charge level as shown in See Fig. 21**Error! Reference source not found.**. **Citation 21: Estimate time left to reach the 100% battery level**  Fig. 21 Source: Snippet taken from OnePlus 3T

	OnePlus 8 is deployed with Android based Operating System (i.e. OS). See Fig. 22**Error! Reference source not found.**. **Citation 22: OnePlus 8 runs Android based OS**  Fig. 22 Source: https://www.oneplus.com/8/specs, Page 1-2, Last Accessed May 18, 2021, Exhibit A Fig. 23 and Fig. 24 show snippets of OnePlus kernel source code that is installed onto the accused product, and the accused product stores battery stored charge value, which is based on the attributes like "mCurrentBatteryLevel" and "mDischargePlugLevel" (i.e., battery charging and discharging).

Citation 23: Stored Charge and Current Charge

```
346         POWER_SUPPLY_ATTR(charge_full_design),
347         POWER_SUPPLY_ATTR(charge_empty_design),
348         POWER_SUPPLY_ATTR(charge_full),
349         POWER_SUPPLY_ATTR(charge_empty),
350         POWER_SUPPLY_ATTR(charge_now),
351         POWER_SUPPLY_ATTR(charge_avg),
352         POWER_SUPPLY_ATTR(charge_counter),
353         POWER_SUPPLY_ATTR(constant_charge_current),
354         POWER_SUPPLY_ATTR(constant_charge_current_max),
355         POWER_SUPPLY_ATTR(constant_charge_voltage),
356         POWER_SUPPLY_ATTR(constant_charge_voltage_max),
357         POWER_SUPPLY_ATTR(charge_control_limit),
358         POWER_SUPPLY_ATTR(charge_control_limit_max),
```

Fig. 23

Source:

https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/cad09e061ef6cf689a4a1e54d27562e0f042236a/drivers/power/supply/power_supply_sysfs.c#L353, Page 5, Last Accessed May 18, 2021, Exhibit E

Citation 24: Battery Charging and Discharging Attributes

```
8705    public long computeChargeTimeRemaining(long curTime) {
8706        if (mOnBattery) {
8707            // Not yet working.
8708            return -1;
8709        }
8710        /* Broken
8711        int curLevel = mCurrentBatteryLevel;
8712        int plugLevel = mDischargePlugLevel;
8713        if (plugLevel < 0 || curLevel < (plugLevel+1)) {
8714            return -1;
8715        }
8716        long duration = computeBatteryRealtime(curTime, STATS_SINCE_UNPLUGGED);
8717        if (duration < 1000*1000) {
8718            return -1;
8719        }
8720        long usPerLevel = duration/(curLevel-plugLevel);
8721        return usPerLevel * (100-curLevel);
8722        */
8723        if (mChargeStepTracker.mNumStepDurations < 1) {
8724            return -1;
8725        }
8726        long msPerLevel = mChargeStepTracker.computeTimePerLevel();
8727        if (msPerLevel <= 0) {
8728            return -1;
8729        }
8730        return (msPerLevel * (100-mCurrentBatteryLevel)) * 1000;
8731    }
```

Fig. 24

Source:

https://github.com/OnePlusOSS/android_frameworks_base/blob/95ba353daa05fdd1c6011554ab7152fadfcdb93

	2/core/java/com/android/internal/os/BatteryStatsImpl.java#L8705, Page 243-244, Last Accessed May 18, 2021, Exhibit I Fig. 25 shows the snippet of source code of Android that computes and stores the time in millisecond (i.e. ms) requires for charging the battery by 1%, in 'msPerLevel', which depends on both charging and discharging. As an example, the time to charge 1% depends on the charging of the battery, as with increased power supply there is a decrease in the displayed charging time. Also, the time to charge 1% depends on the discharging of the battery caused by the processing load, resulting in an increase in the battery's charging time. The accused product running android based OS computes the time remaining to charge battery, in constant current, by multiplying the 'msPerLevel' with battery level remaining to charge. See Fig. 25 - Fig. 28.

Citation 25: Computation of remaining time based on per step level

```
12572       @Override
12573       public long computeChargeTimeRemaining(long curTime) {
12574           if (mOnBattery) {
12575               // Not yet working.
12576               return -1;
12577           }
12578           if (mBatteryTimeToFullSeconds >= 0) {
12579               return mBatteryTimeToFullSeconds * (1000 * 1000); // s to us
12580           }
12581           // Else use algorithmic approach
12582           if (mChargeStepTracker.mNumStepDurations < 1) {
12583               return -1;
12584           }
12585           long msPerLevel = mChargeStepTracker.computeTimePerLevel();
12586           if (msPerLevel <= 0) {
12587               return -1;
12588           }
12589           return (msPerLevel * (100 - mCurrentBatteryLevel)) * 1000;
12590       }
```

Fig. 25

Source:

https://android.googlesource.com/platform/frameworks/base.git/+/master/core/java/com/android/internal/os/BatteryStatsImpl.java#12604, Page 1, Last Accessed May 18, 2021, Exhibit J

Citation 26: Battery Charging and Discharging Attributes

```
8705    public long computeChargeTimeRemaining(long curTime) {
8706        if (mOnBattery) {
8707            // Not yet working.
8708            return -1;
8709        }
8710        /* Broken
8711        int curLevel = mCurrentBatteryLevel;
8712        int plugLevel = mDischargePlugLevel;
8713        if (plugLevel < 0 || curLevel < (plugLevel+1)) {
8714            return -1;
8715        }
8716        long duration = computeBatteryRealtime(curTime, STATS_SINCE_UNPLUGGED);
8717        if (duration < 1000*1000) {
8718            return -1;
8719        }
8720        long usPerLevel = duration/(curLevel-plugLevel);
8721        return usPerLevel * (100-curLevel);
8722        */
8723        if (mChargeStepTracker.mNumStepDurations < 1) {
8724            return -1;
8725        }
8726        long msPerLevel = mChargeStepTracker.computeTimePerLevel();
8727        if (msPerLevel <= 0) {
8728            return -1;
8729        }
8730        return (msPerLevel * (100-mCurrentBatteryLevel)) * 1000;
8731    }
```

Fig. 26

Source:

https://github.com/OnePlusOSS/android_frameworks_base/blob/95ba353daa05fdd1c6011554ab7152fadfcdb93

2/core/java/com/android/internal/os/BatteryStatsImpl.java#L8705, Page 243-244, Last Accessed May 18, 2021 Exhibit I

Citation 27: BatteryStats.Java uses BatteryStatsImpl data to provide

```
76      static IBatteryStats sService;
77      final BatteryStatsImpl mStats;
78      final BatteryStatsHandler mHandler;
79      Context mContext;
80      PowerManagerInternal mPowerManagerInternal;
```

Fig. 27

Source: https://github.com/OnePlusOSS/android_frameworks_base/blob/95ba353daa05fdd1c6011554ab7152fadfcdb932/services/core/java/com/android/server/am/BatteryStatsService.java#L337, Page 3, Last Accessed May 18, 2021, Exhibit F

Citation 28: BatteryStats.Java uses BatteryStatsImpl data to provide

```
337     public long computeChargeTimeRemaining() {
338         synchronized (mStats) {
339             long time = mStats.computeChargeTimeRemaining(SystemClock.elapsedRealtime());
340             return time >= 0 ? (time/1000) : time;
341         }
342     }
```

	Fig. 28 Source: https://github.com/OnePlusOSS/android_frameworks_base/blob/95ba353daa05fdd1c6011554ab7152fadfcdb932/services/core/java/com/android/server/am/BatteryStatsService.java#L337, Page 9, Last Accessed May 18, 2021, Exhibit F
2. The method of claim 1, wherein the battery stored charge characteristics comprise data that provides a remaining charging time estimate based on a battery stored charge estimate.	The accused product practices a method, wherein the battery stored charge characteristics comprise data that provides a remaining charging time estimate based on a battery stored charge estimate. Fig. 29 shows snippets of the OnePlus kernel source code that is installed onto the accused product, and the accused product stores battery stored charge value and accordingly "computeChargeTimeRemaining" (i.e., remaining charging time) is estimated. See Fig. 30.

Citation 29: Stored Charge and Current Charge

```
346         POWER_SUPPLY_ATTR(charge_full_design),
347         POWER_SUPPLY_ATTR(charge_empty_design),
348         POWER_SUPPLY_ATTR(charge_full),
349         POWER_SUPPLY_ATTR(charge_empty),
350         POWER_SUPPLY_ATTR(charge_now),
351         POWER_SUPPLY_ATTR(charge_avg),
352         POWER_SUPPLY_ATTR(charge_counter),
353         POWER_SUPPLY_ATTR(constant_charge_current),
354         POWER_SUPPLY_ATTR(constant_charge_current_max),
355         POWER_SUPPLY_ATTR(constant_charge_voltage),
356         POWER_SUPPLY_ATTR(constant_charge_voltage_max),
357         POWER_SUPPLY_ATTR(charge_control_limit),
358         POWER_SUPPLY_ATTR(charge_control_limit_max),
```

Fig. 29

Source:

https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/cad09e061ef6cf689a4a1e54d27562e0f042236a/drivers/power/supply/power_supply_sysfs.c#L353, Page 5, Last Accessed May 18, 2021, Exhibit E

Citation 30: Remaining Charging Time Estimation

```
8705    public long computeChargeTimeRemaining(long curTime) {
8706        if (mOnBattery) {
8707            // Not yet working.
8708            return -1;
8709        }
8710        /* Broken
8711        int curLevel = mCurrentBatteryLevel;
8712        int plugLevel = mDischargePlugLevel;
8713        if (plugLevel < 0 || curLevel < (plugLevel+1)) {
8714            return -1;
8715        }
8716        long duration = computeBatteryRealtime(curTime, STATS_SINCE_UNPLUGGED);
8717        if (duration < 1000*1000) {
8718            return -1;
8719        }
8720        long usPerLevel = duration/(curLevel-plugLevel);
8721        return usPerLevel * (100-curLevel);
8722        */
8723        if (mChargeStepTracker.mNumStepDurations < 1) {
8724            return -1;
8725        }
8726        long msPerLevel = mChargeStepTracker.computeTimePerLevel();
8727        if (msPerLevel <= 0) {
8728            return -1;
8729        }
8730        return (msPerLevel * (100-mCurrentBatteryLevel)) * 1000;
8731    }
```

Fig. 30

Source:

https://github.com/OnePlusOSS/android_frameworks_base/blob/95ba353daa05fdd1c6011554ab7152fadfcdb932/core/java/com/android/internal/os/BatteryStatsImpl.java#L8705, Page 243-244, Last Accessed May 18, 2021, Exhibit I

4. The method of claim 1, wherein the time remaining to charge in the constant voltage phase is based on charging current characteristics in the constant voltage phase, when the battery charging point is in the constant voltage phase.	The accused product practices a method, wherein the time remaining to charge in the constant voltage phase is based on charging current characteristics in the constant voltage phase, when the battery charging point is in the constant voltage phase. Fig. 31 to Fig. 34 shows snippets of OnePlus kernel source code that is installed onto the accused product. The accused product determines whether the power supply (or, Warp Charge 30 Power Adapter) is in constant current phase or constant voltage phase by using 'power_supply_property psp' which comprises attributes for the battery charging characteristics and associates the psp enum value accordingly. **Citation 31: psp enum value determination** 17 18 #define PSY_PROP(psy, prop, val) (power_supply_get_property(psy, \ 19 POWER_SUPPLY_PROP_##prop, val)) 20 21 #define _MPSY_PROP(prop, val) (power_supply_get_property(main_battery, \ 22 prop, val)) 23 24 #define MPSY_PROP(prop, val) _MPSY_PROP(POWER_SUPPLY_PROP_##prop, val) Fig. 31 Source: https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/cad09e061ef6cf689a4a1e54d27562e0f042236a/drivers/power/supply/apm_power.c, Page 1, Last Accessed May 18, 2021, Exhibit G

Citation 32: Power Supply Property

```
144  static ssize_t power_supply_show_property(struct device *dev,
145                                            struct device_attribute *attr,
146                                            char *buf) {
147          ssize_t ret;
148          struct power_supply *psy = dev_get_drvdata(dev);
149          enum power_supply_property psp = attr - power_supply_attrs;
150          union power_supply_propval value;
```

Fig. 32

Source: https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/cad09e061ef6cf689a4a1e54d27562e0f042236a/drivers/power/supply/power_supply_sysfs.c#L353, Page 2, Last Accessed May 18, 2021, Exhibit E

Citation 33: Device Attributes for Power Supply

```
298  /* Must be in the same order as POWER_SUPPLY_PROP_* */
299  static struct device_attribute power_supply_attrs[] = {
300          /* Properties of type `int' */
301          POWER_SUPPLY_ATTR(status),
302  /* @bsp, 2018/07/13 Battery & Charging porting */
303          POWER_SUPPLY_ATTR(set_allow_read_extern_fg_iic),
304          POWER_SUPPLY_ATTR(cc_to_cv_point),
305          POWER_SUPPLY_ATTR(chg_protect_status),
```

Fig. 33

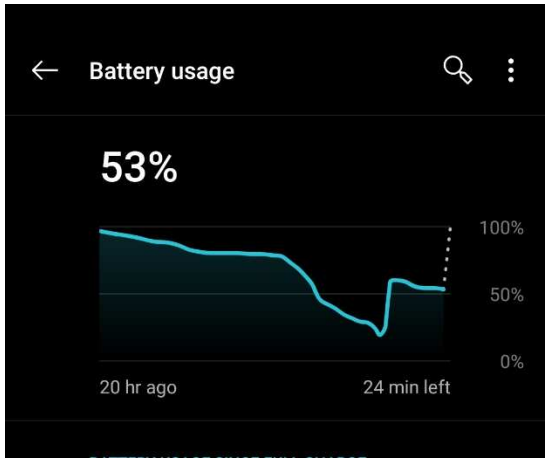
Source: https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/cad09e061ef6cf689a4a1e54d27562e0f042236a/drivers/power/supply/power_supply_sysfs.c#L353, Page 4, Last Accessed May 18, 2021, Exhibit E

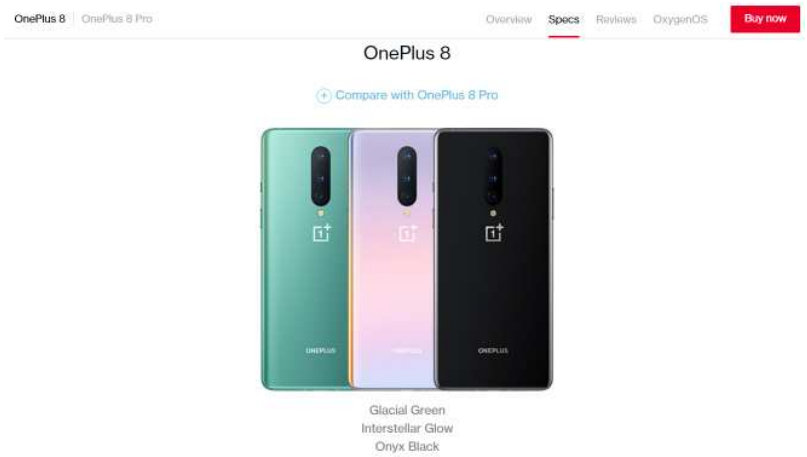
Citation 34: Constant Current & Constant Voltage in Power Supply Property

```
363 static int axp288_charger_usb_set_property(struct power_supply *psy,
364                                               enum power_supply_property psp,
365                                               const union power_supply_propval *val)
366 {
367         struct axp288_chrg_info *info = power_supply_get_drvdata(psy);
368         int ret = 0;
369         int scaled_val;
370
371         switch (psp) {
372         case POWER_SUPPLY_PROP_CONSTANT_CHARGE_CURRENT:
373                 scaled_val = min(val->intval, info->max_cc);
374                 scaled_val = DIV_ROUND_CLOSEST(scaled_val, 1000);
375                 ret = axp288_charger_set_cc(info, scaled_val);
376                 if (ret < 0)
377                         dev_warn(&info->pdev->dev, "set charge current failed\n");
378                 break;
379         case POWER_SUPPLY_PROP_CONSTANT_CHARGE_VOLTAGE:
380                 scaled_val = min(val->intval, info->max_cv);
381                 scaled_val = DIV_ROUND_CLOSEST(scaled_val, 1000);
382                 ret = axp288_charger_set_cv(info, scaled_val);
383                 if (ret < 0)
384                         dev_warn(&info->pdev->dev, "set charge voltage failed\n");
385                 break;
386         case POWER_SUPPLY_PROP_INPUT_CURRENT_LIMIT:
387                 ret = axp288_charger_set_vbus_inlmt(info, val->intval);
388                 if (ret < 0)
389                         dev_warn(&info->pdev->dev, "set input current limit failed\n");
390                 break;
391         default:
392                 ret = -EINVAL;
393         }
```

Fig. 34

	Source:https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/d0cd6cd30f8e10b209461f24462ed316c76bc913/drivers/power/supply/axp288_charger.c#L363, Page 5, Last Accessed May 18, 2021, Exhibit H When the accused product is connected to the charger, firstly it takes full current, but when the battery reaches a certain point of voltage, the type of charging switches to constant voltage from constant current. In the CV (i.e., constant voltage) mode, the voltage is set to 4.2V, and accordingly current (i.e., charging current characteristics) is allowed to charge device to 100%. See Fig. 35. **Citation 35: Constant Current Phase and Constant Voltage Phase** 4) The process of charging li-ion batt goes like this (let's start from full current): a) CC (constant current) stage which means the battery takes full current, in this case 4A but frankly it's 3,4-3,6A. For 3,3Ah battery it's current around 1,1C, it's perfectly good value for battery life. b) when battery reaches certain point of voltage (on Dash I noticed it's around 60-70% approx.), current drops naturally and it keeps going down with increasing voltage c) CV (constant voltage) means BMS sets 4,2V (usual value for 100% capacity of lithium cell) and current is going to 0A since your battery is almost charged at this point e.g 4,1V and charger gives 4,2V which is 4,2-4,1V = 0,1V, it allows really low current. But it's important to charge to 100% because last stage lasts long but it gives you significantly more capacity, especially for only 3,3Ah cell. Moreover, this stage is most dangerous because voltage for almost fully charged cell becomes unstable and when it takes current, it'll increase voltage easily and rapidly. That's why cut off current has to work and stops charging when it's time. The process can go a few times e.g. if battery goes >4,2V, the charger disconnects, waits few seconds, lower current from charger and starts charging again. And after e.g. 3 repeates, it ends the charging process for good. Fig. 35 Source: https://forums.oneplus.com/threads/how-to-charge-the-battery-correctly.780695/, Page 3, Last Accessed May 18, 2021, Exhibit D

	Citation 36: Estimation of time left to reach the 100% battery level  Fig. 36 Source: Snippet taken from OnePlus 3T
5Pre. The method of claim 1, further comprising: **5a.** identifying, by the apparatus, a correct category of the charger	The accused product practices a method comprising identifying, by the apparatus, a correct category of the charger adapter after detecting its availability. OnePlus provides smartphones such as OnePlus 8 that come along with a Warp Charge 30 Power Adapter. The Warp Charge 30 Power Adapter (i.e., charger adapter) delivers a 30-Watt power output for fast charging the accused product. See Fig. 37 and Fig. 38.

adapter after detecting its availability; and	**Citation 37: OnePlus 8**  Fig. 37 Source: https://www.oneplus.com/8/specs, Page 1, Last Accessed May 18, 2021, Exhibit A **Citation 38: Warp Charge 30 Power Adapter**  Fig. 38 Source: https://www.oneplus.com/8/specs, Page 4, Last Accessed May 18, 2021, Exhibit A

	The accused product displays "Warp charging" (i.e., correct category of the charger adapter) as it gets connected (i.e., detecting its availability) with the Warp Charge 30 Power Adapter via the Warp Type-C cable as shown in Fig. 39. **Citation 39: Warp Charging display**  Fig. 39 Source: https://www.androidcentral.com/warp-charge, Page 3, Last Accessed July 24, 2020, Exhibit B

5b. configuring, by the apparatus, battery charging based in the category of the charger adapter.	The accused product practices a method comprising configuring, by the apparatus, battery charging based in the category of the charger adapter. Once the accused product is connected with the Warp Charge 30 Power Adapter (i.e., charger adapter), the battery charging is configured, and the current battery status is displayed on the screen. See Fig. 40. **Citation 40: Warp Charging display**  Fig. 40

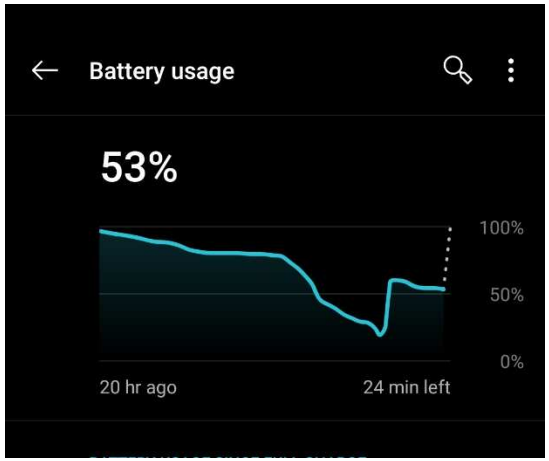
	Source: https://www.androidcentral.com/warp-charge, Page 3, Last Accessed July 24, 2020, Exhibit B
6Pre. The method of claim 1, further comprising: **6a.** identifying, by the apparatus, a correct category of the charger adapter after detecting its availability; and	The accused product practices a method identifying, by the apparatus, a correct category of the charger adapter after detecting its availability. *Refer to supporting evidence of claim element 5[a].*
6b. using, by the apparatus, the category of the charger adapter to improve accuracy of an initial remaining charging time estimation.	The accused product practices a method comprising using, by the apparatus, the category of the charger adapter to improve accuracy of an initial remaining charging time estimation. Once the accused product is connected with the Warp Charge 30 Power Adapter (i.e., charger adapter), the battery charging is configured, and the current battery status is displayed on the screen. See Fig. 41.

Citation 41: Warp Charging display

Fig. 41

Source: https://www.androidcentral.com/warp-charge, Page 3, Last Accessed July 24, 2020, Exhibit B

Also, the accused product estimates and displays the time remaining to fully charge the device. See Fig. 42.

	Citation 42: Estimation of time left to reach the 100% battery level  Fig. 42 Source: Snippet taken from OnePlus 3T
7. The method of claim 1, further comprising: calculating, by the apparatus, a time remaining to charge in the constant current phase based on the constant current phase	The accused product practices a method comprising calculating, by the apparatus, a time remaining to charge in the constant current phase based on the constant current phase charging characteristics and a time remaining to charge in the constant voltage phase based on the constant voltage phase charging characteristics, if the battery charging point is in the constant current phase. *Refer to supporting evidence of claim element 1[c] and 1[e].*

charging characteristics and a time remaining to charge in the constant voltage phase based on the constant voltage phase charging characteristics, if the battery charging point is in the constant current phase.	
14Pre. A non-transitory computer readable medium, comprising program instructions, which when executed by a computer processor, perform:	The accused product comprises a non-transitory computer readable medium comprising program instructions, which when executed by a computer processor. OnePlus 8 series comprises of 5G supported Qualcomm Snapdragon 865 processor along with RAM/ROM for various storage purposes. See Fig. 43.

Citation 43: One Plus 8 Specifications

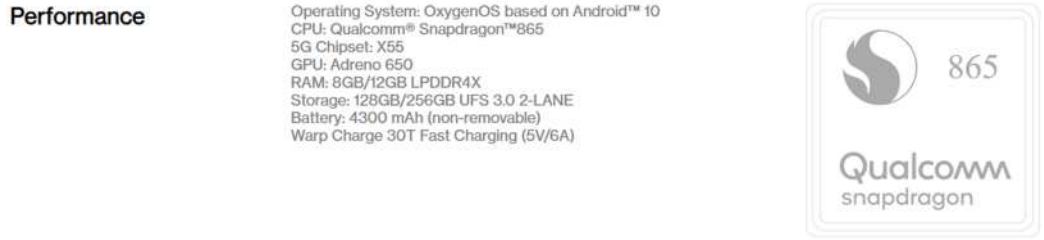


Fig. 43

Source: https://www.oneplus.in/8/specs, Page 1-2, Last Accessed May 18, 2021, Exhibit A

Moreover, the accused product contains program instructions for the fulfillment of various purposes. See Fig. 44.

Citation 44: Exemplary Program Instructions used in the accused product

```
144  static ssize_t power_supply_show_property(struct device *dev,
145                                            struct device_attribute *attr,
146                                            char *buf) {
147          ssize_t ret;
148          struct power_supply *psy = dev_get_drvdata(dev);
149          enum power_supply_property psp = attr - power_supply_attrs;
150          union power_supply_propval value;
```

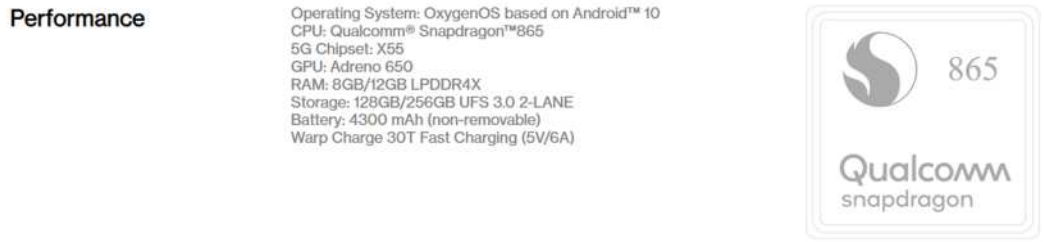
Fig. 44

	Source: https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/cad09e061ef6cf689a4a1e54d27562e0f042236a/drivers/power/supply/power_supply_sysfs.c#L353, Page 2, Last Accessed May 18, 2021, Exhibit E
14a. detecting an availability of a charger adapter;	The accused product comprises a non-transitory computer readable medium comprising program instructions for detecting an availability of a charger adapter. *Refer to supporting evidence of claim element 1[a].*
14b. determining whether a battery charging point is in a constant current phase or in a constant voltage phase, based on pre-determined battery charging characteristics, wherein the pre-determined battery charging characteristics comprise constant current phase charging characteristics	The accused product comprises a non-transitory computer readable medium comprising program instructions for determining whether a battery charging point is in a constant current phase or in a constant voltage phase, based on pre-determined battery charging characteristics, wherein the pre-determined battery charging characteristics comprise constant current phase charging characteristics and constant voltage phase charging characteristics. *Refer to supporting evidence of claim element 1[b].*

and constant voltage phase charging characteristics;	
14c. calculating a time remaining to charge in the constant current phase based on the constant current phase charging characteristics, if the battery charging point is in the constant current phase; and	The accused product comprises a non-transitory computer readable medium comprising program instructions for calculating a time remaining to charge in the constant current phase based on the constant current phase charging characteristics, if the battery charging point is in the constant current phase. *Refer to supporting evidence of claim element 1[c].*
14d. calculating a time remaining to charge in the constant voltage phase based on the constant voltage phase charging characteristics, if the battery charging point	The accused product comprises a non-transitory computer readable medium comprising program instructions for calculating a time remaining to charge in the constant voltage phase based on the constant voltage phase charging characteristics, if the battery charging point is in the constant voltage phase. *Refer to supporting evidence of claim element 1[d].*

is in the constant voltage phase;	
14e. wherein the time remaining to charge in the constant current phase is based on stored charge characteristics in the constant current phase, when the battery charging point is in the constant current phase and wherein battery stored charge characteristics comprises a battery stored charge value based on monitored tracking of battery charging and discharging.	The accused product comprises a non-transitory computer readable medium comprising program instructions wherein the time remaining to charge in the constant current phase is based on stored charge characteristics in the constant current phase, when the battery charging point is in the constant current phase and wherein battery stored charge characteristics comprises a battery stored charge value based on monitored tracking of battery charging and discharging. *Refer to supporting evidence of claim element 1[e].*
15Pre. An apparatus, comprising:	The accused product comprises at least one processor.

15a. at least one processor;	OnePlus 8 series comprises of 5G supported Qualcomm Snapdragon 865 processor. See Fig. 45. **Citation 45: One Plus 8 Specifications** **Performance** Operating System: OxygenOS based on Android™ 10 CPU: Qualcomm® Snapdragon™865 5G Chipset: X55 GPU: Adreno 650 RAM: 8GB/12GB LPDDR4X Storage: 128GB/256GB UFS 3.0 2-LANE Battery: 4300 mAh (non-removable) Warp Charge 30T Fast Charging (5V/6A) Fig. 45 Source: https://www.oneplus.in/8/specs, Page 1-2, Last Accessed May 18, 2021, Exhibit A
15b. at least one memory including computer program code;	The accused product comprises at least one memory including computer program code. OnePlus 8 comprises RAM and ROM for various storage purposes. See Fig. 46.

	Citation 46: One Plus 8 Specifications  Fig. 46 Source: https://www.oneplus.in/8/specs, Page 1-2, Last Accessed May 18, 2021, Exhibit A
15c. the at least one memory and the computer program code configured to, with the at least one processor, cause the processor at least to:	The accused product comprises at least one memory and the computer program code configured with the at least one processor. OnePlus 8 series comprises of 5G supported Qualcomm Snapdragon 865 processor along with RAM/ROM for various storage purposes. See Fig. 47.

Citation 47: One Plus 8 Specifications

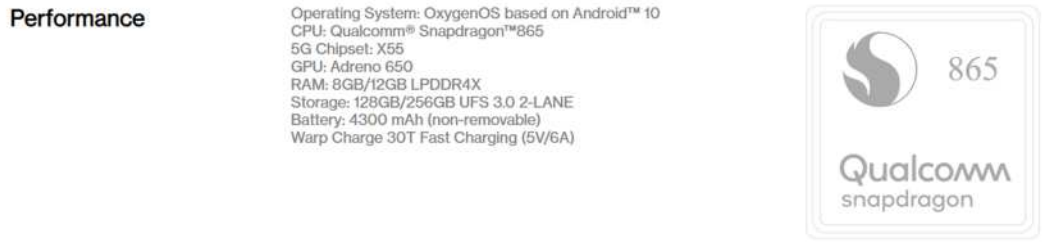


Fig. 47

Source: https://www.oneplus.in/8/specs, Page 1-2, Last Accessed May 18, 2021, Exhibit A

Moreover, the accused product contains computer program code for the fulfillment of various purposes. See Fig. 48.

Citation 48: Exemplary Computer Program Code used in the accused product

```
144  static ssize_t power_supply_show_property(struct device *dev,
145                                            struct device_attribute *attr,
146                                            char *buf) {
147          ssize_t ret;
148          struct power_supply *psy = dev_get_drvdata(dev);
149          enum power_supply_property psp = attr - power_supply_attrs;
150          union power_supply_propval value;
```

Fig. 48

	Source: https://github.com/OnePlusOSS/android_kernel_oneplus_sm8250/blob/cad09e061ef6cf689a4a1e54d27562e0f042236a/drivers/power/supply/power_supply_sysfs.c#L353, Page 2, Last Accessed May 18, 2021, Exhibit E
15d. detect an availability of a charger adapter;	The accused product is an apparatus comprising at least one processor to detect an availability of a charger adapter. *Refer to supporting evidence of claim element 1[a].*
15e. determine whether a battery charging point is in a constant current phase or in a constant voltage phase, based on pre-determined battery charging characteristics, wherein the pre-determined battery charging characteristics comprise constant current phase charging characteristics and constant voltage	The accused product is an apparatus comprising at least one processor to determine whether a battery charging point is in a constant current phase or in a constant voltage phase, based on pre-determined battery charging characteristics, wherein the pre-determined battery charging characteristics comprise constant current phase charging characteristics and constant voltage phase charging characteristics. *Refer to supporting evidence of claim element 1[b].*

phase charging characteristics;	
15f. calculate a time remaining to charge in the constant current phase based on the constant current phase charging characteristics, if the battery charging point is in the constant current phase; and	The accused product is an apparatus comprising at least one processor to calculate a time remaining to charge in the constant current phase based on the constant current phase charging characteristics, if the battery charging point is in the constant current phase. *Refer to supporting evidence of claim element 1[c].*
15g. calculate a time remaining to charge in the constant voltage phase based on the constant voltage phase charging characteristics, if the battery charging point is in the constant voltage phase;	The accused product is an apparatus comprising at least one processor to calculate a time remaining to charge in the constant voltage phase based on the constant voltage phase charging characteristics, if the battery charging point is in the constant voltage phase. *Refer to supporting evidence of claim element 1[d].*

15h. wherein the time remaining to charge in the constant current phase is based on stored charge characteristics in the constant current phase, when the battery charging point is in the constant current phase and wherein battery stored charge characteristics comprises a battery stored charge value based on monitored tracking of battery charging and discharging.	The accused product is an apparatus comprising at least one processor wherein the time remaining to charge in the constant current phase is based on stored charge characteristics in the constant current phase, when the battery charging point is in the constant current phase and wherein battery stored charge characteristics comprises a battery stored charge value based on monitored tracking of battery charging and discharging. *Refer to supporting evidence of claim element 1[e].*
16. The apparatus of claim 15, wherein the battery stored charge characteristics	The accused product is an apparatus comprising at least one processor wherein the battery stored charge characteristics comprise data that provides a remaining charging time estimate based on a battery stored charge estimate.

comprise data that provides a remaining charging time estimate based on a battery stored charge estimate.	*Refer to supporting evidence of claim element 2.*